2 ALTERNATIVES

This chapter describes the alternatives analyzed in this EIS. They are as follows:

1. No Action: Deny both permit and corresponding ROW applications. This presents the environmental impacts in the United States as if the lines had never been constructed and provides a baseline against which the impacts in the United States of the action alternatives can be measured in the absence of Presidential permits and corresponding ROWs.

2. Proposed Action: Grant one or both permits and corresponding ROWs. This sets forth the impacts in the United States of constructing and operating the line(s) from the Mexico power plants as those plants are presently designed.

3. Alternative Technologies: Grant one or both permits and corresponding ROWs to authorize transmission lines that connect to power plants that would employ more efficient emissions controls and alternative cooling technologies.

4. Mitigation Measures: Grant one or both permits and corresponding ROWs to authorize transmission lines whose developers would employ off-site mitigation measures to minimize environmental impacts in the United States.

DOE and BLM also consider alternative routes for the transmission lines within the United States under the action alternatives described above.

2.1 NO ACTION

Under the no action alternative, neither of the proposed transmission lines would be constructed, and the environmental impacts associated with their construction and operation would not occur. In the case of Sempra, lack of the requested transmission line would preclude the Termoeléctrica de Mexicali (TDM) power plant from operating because there would be no delivery path for the electricity generated. Similarly, in the case of Intergen, the EBC export unit could not operate because the proposed transmission line would have provided the only delivery path for the electricity generated from that unit.

However, the EAX unit at the La Rosita Power Complex (LRPC) could still operate. The existing SDG&E transmission line has sufficient capacity to transmit the electrical output of the EAX export gas turbine and one-third (90 MW) of the EAX steam turbine output to the United States. The other two EAX gas turbines and the remaining two-thirds (180 MW) of the electrical output of the EAX steam turbine are designated for the Mexico market and would operate under any and all circumstances.

Because DOE and BLM prepared this EIS under the assumption that the proposed Intergen and Sempra transmission lines do not exist, the EIS does not address the removal of their lines and support structures from BLM lands. Should the Presidential permits and ROWs not be granted, the issue of whether to remove the existing lines from BLM lands would be a new Federal action subject to an appropriate separate NEPA review.

2.2 PROPOSED ACTION: GRANT ONE OR BOTH PRESIDENTIAL PERMITS AND CORRESPONDING ROWS

Under the proposed action alternative, one or both Sempra and Intergen transmission lines would be constructed and operated, and all generating units at the TDM and LRPC power plants would be able to operate. DOE's and BLM's preferred alternative would be to issue both Presidential permits and ROWs to Sempra and Intergen as their projects are presently designed.

The impacts attributable to the preferred alternative would be those associated with the construction and operation of the proposed transmission lines, as well as those associated with operations of the TDM power plant and the EBC unit at the LRPC. If the proposed Intergen transmission line were approved and constructed, the electrical output of the EAX export turbine at the LRPC would be exported to the United States over that line. Therefore, even though the EAX export turbine would be able to operate under the no action alternative, for purposes of this EIS, the impacts associated with this turbine are also included in the proposed action. This approach has been taken in the interest of conservatism and does not reflect a legal conclusion that the operation of the EAX export turbine is an effect of the approval of the Intergen transmission line.

2.2.1 Descriptions of Proposed Transmission Lines

The proposed transmission lines would be located in the Yuha Basin in the Colorado Desert in the southwestern portion of Imperial County, California, about 10 to 12 mi (16 to 18 km) southwest of the town of El Centro (Figures 1.1-1, 2.2-1, and 2.2-2). Each proposed project would construct a double-circuit, 230-kV transmission line extending from the existing IV Substation south approximately 6 mi (10 km) to the U.S.-Mexico border in BLM-designated Utility Corridor N, where each line would connect with a corresponding transmission line in Mexico (Figures 2.2-3 through 2.2-6). The transmission line support structures would consist of steel lattice towers from the border to just south of the IV Substation, where steel A-frame structures would be used for each transmission line to allow the crossing of the Southwest Power Link (Figure 2.2-3). The Southwest Power Link is a 500-kV transmission line that enters the IV Substation from the east at the substation's southeast corner. After crossing the Southwest Power Link, the proposed transmission lines would be supported by steel monopoles along the east side of the IV Substation and would enter it from the north.

From the U.S.-Mexico border to the last tower south of the Southwest Power Link at the IV Substation, both the Intergen and Sempra ROWs would parallel the existing line. The ROW

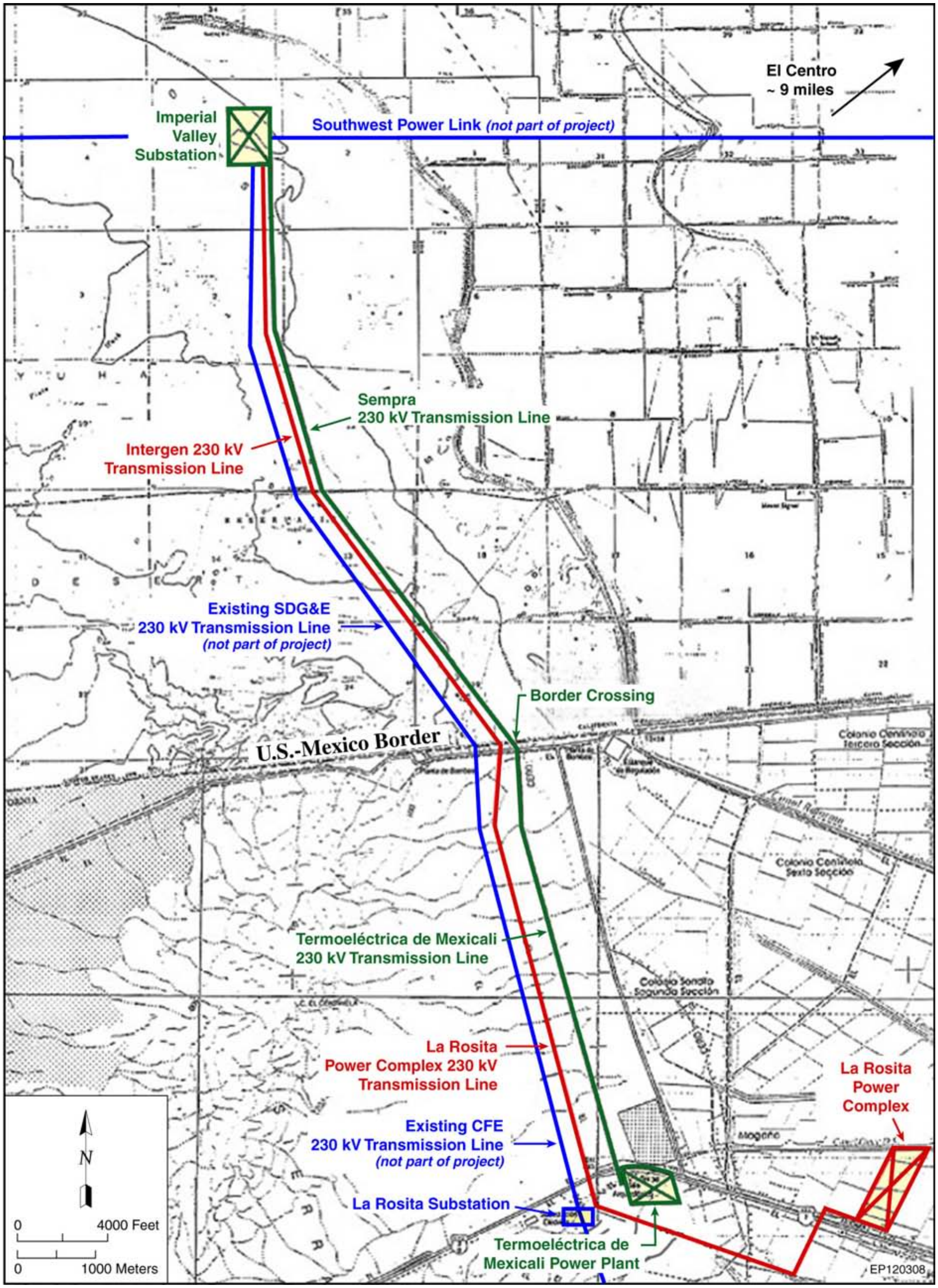

FIGURE 2.2-1 General Area Map Showing the Proposed Transmission Lines

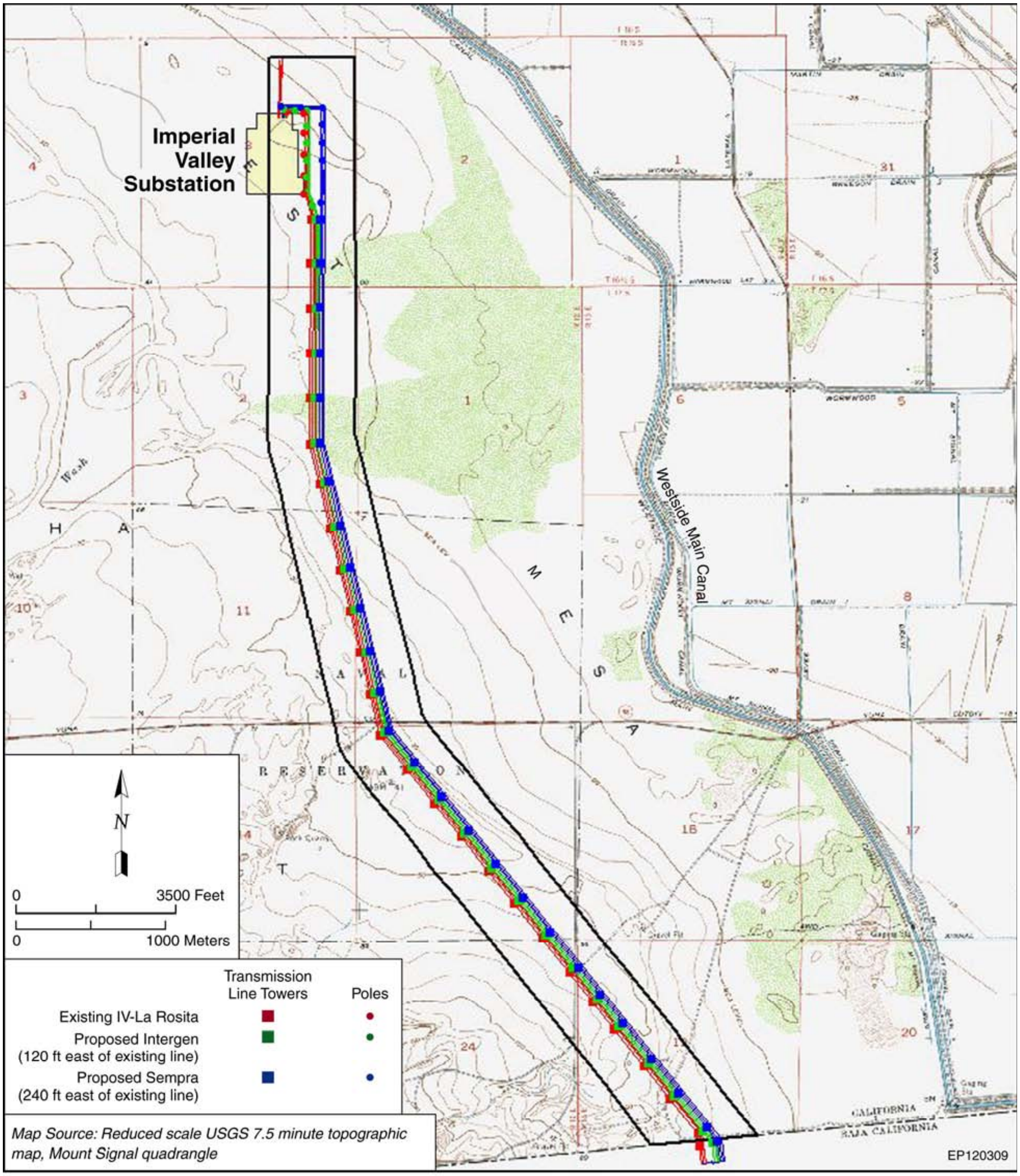

FIGURE 2.2-2 Location of Existing and Proposed Transmission Lines as Shown on U.S. Geological Survey Topographic Map

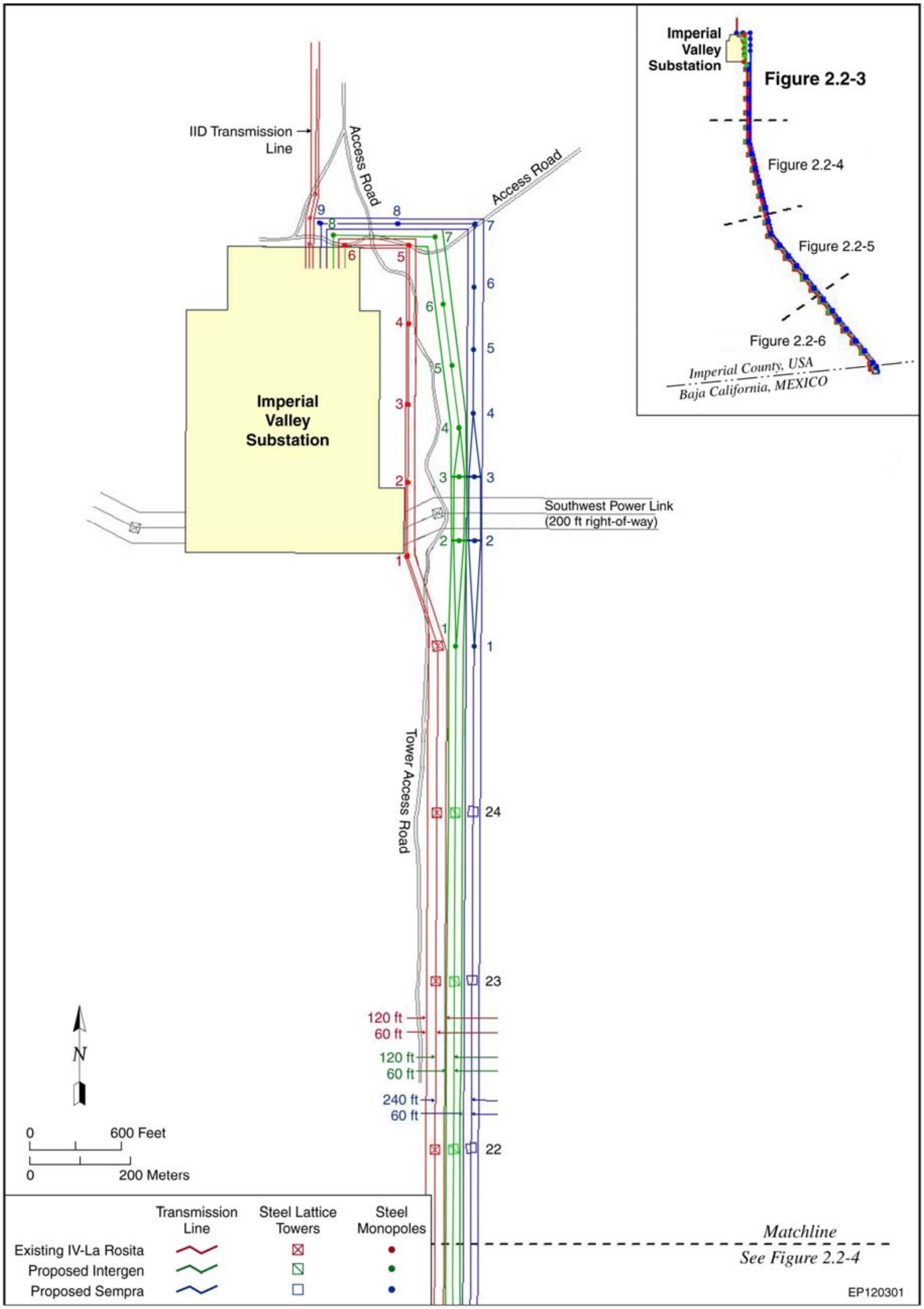

FIGURE 2.2-3 Projects' Plan — Segment A

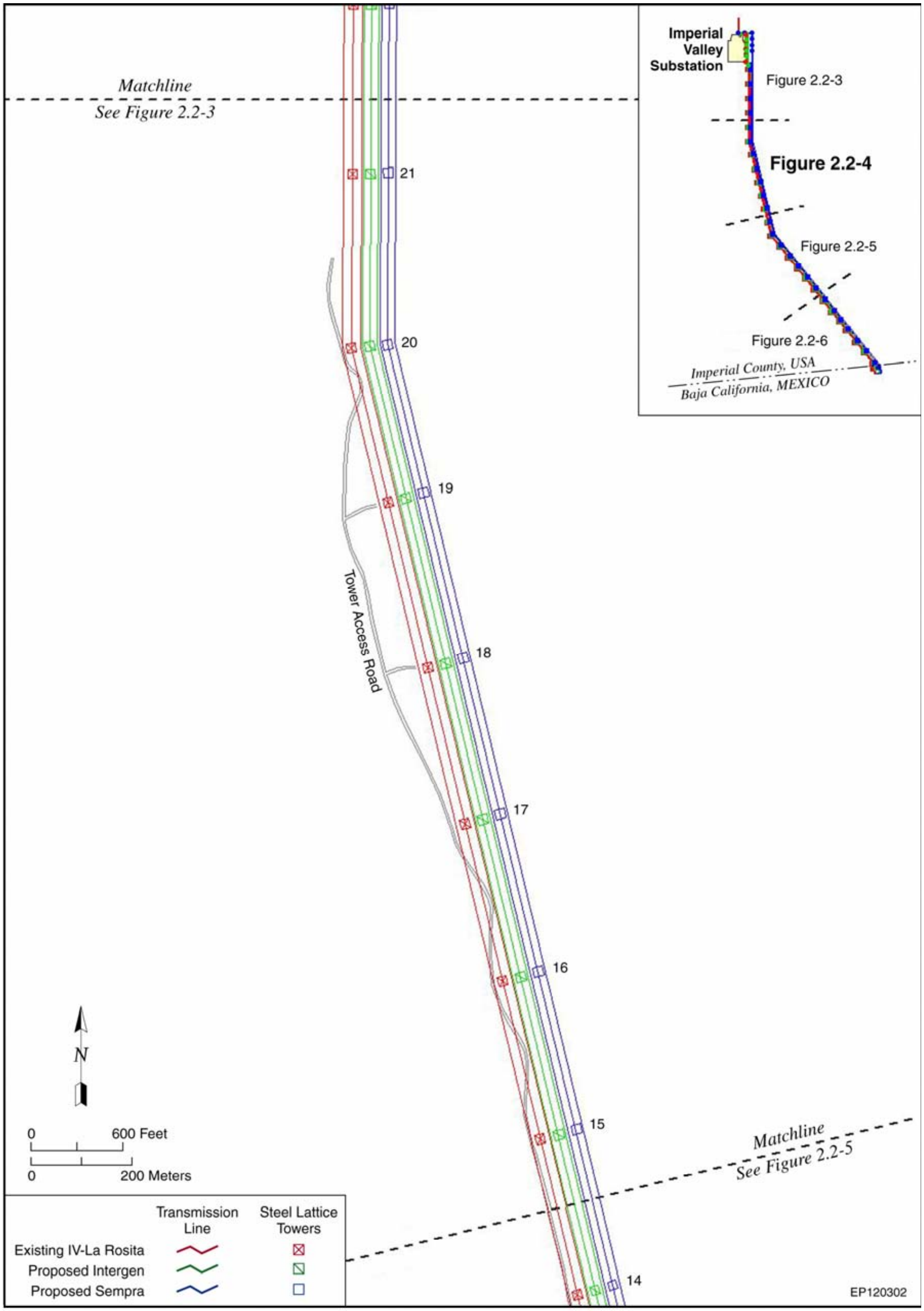

FIGURE 2.2-4 Projects' Plan — Segment B

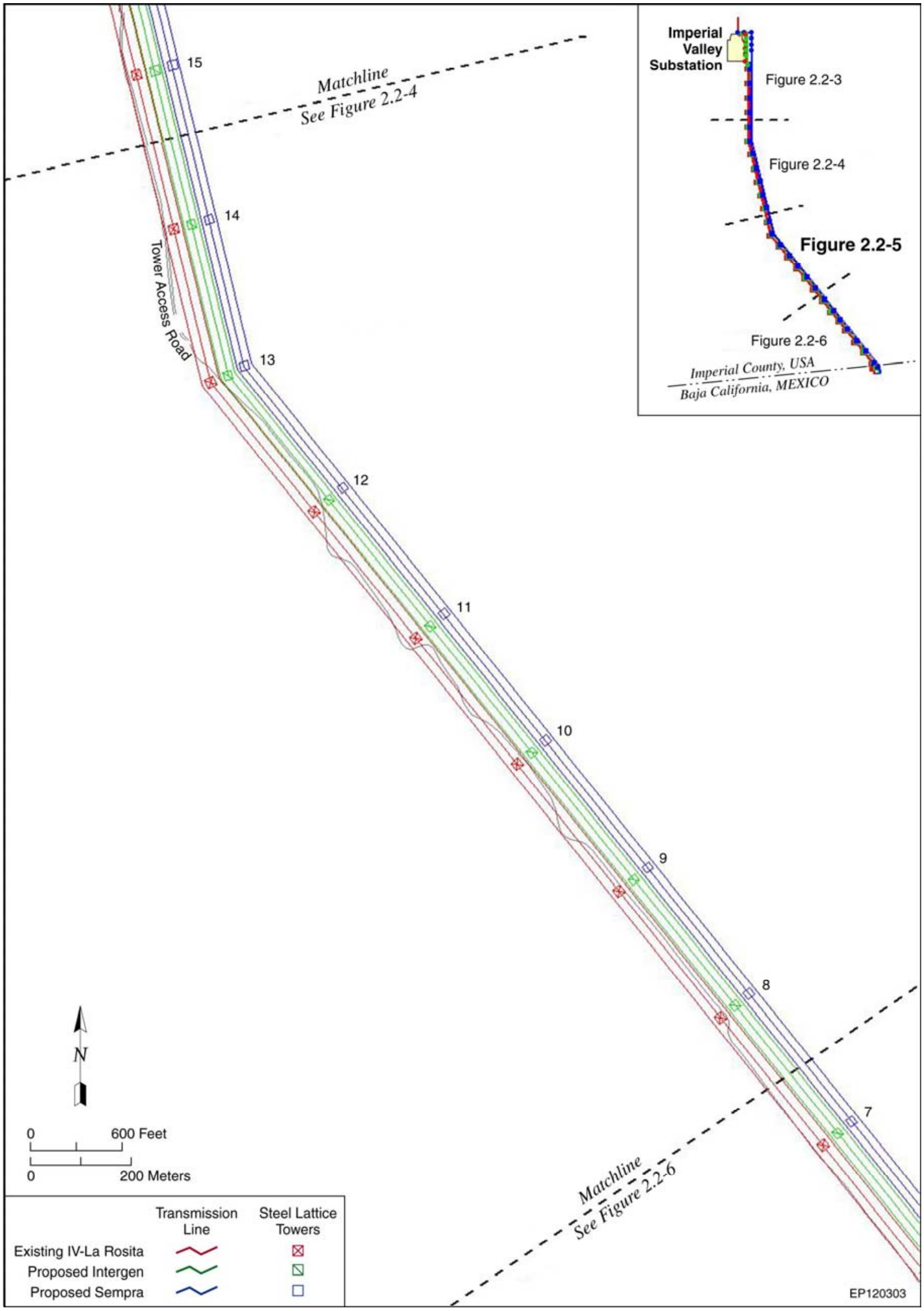

FIGURE 2.2-5 Projects' Plan — Segment C

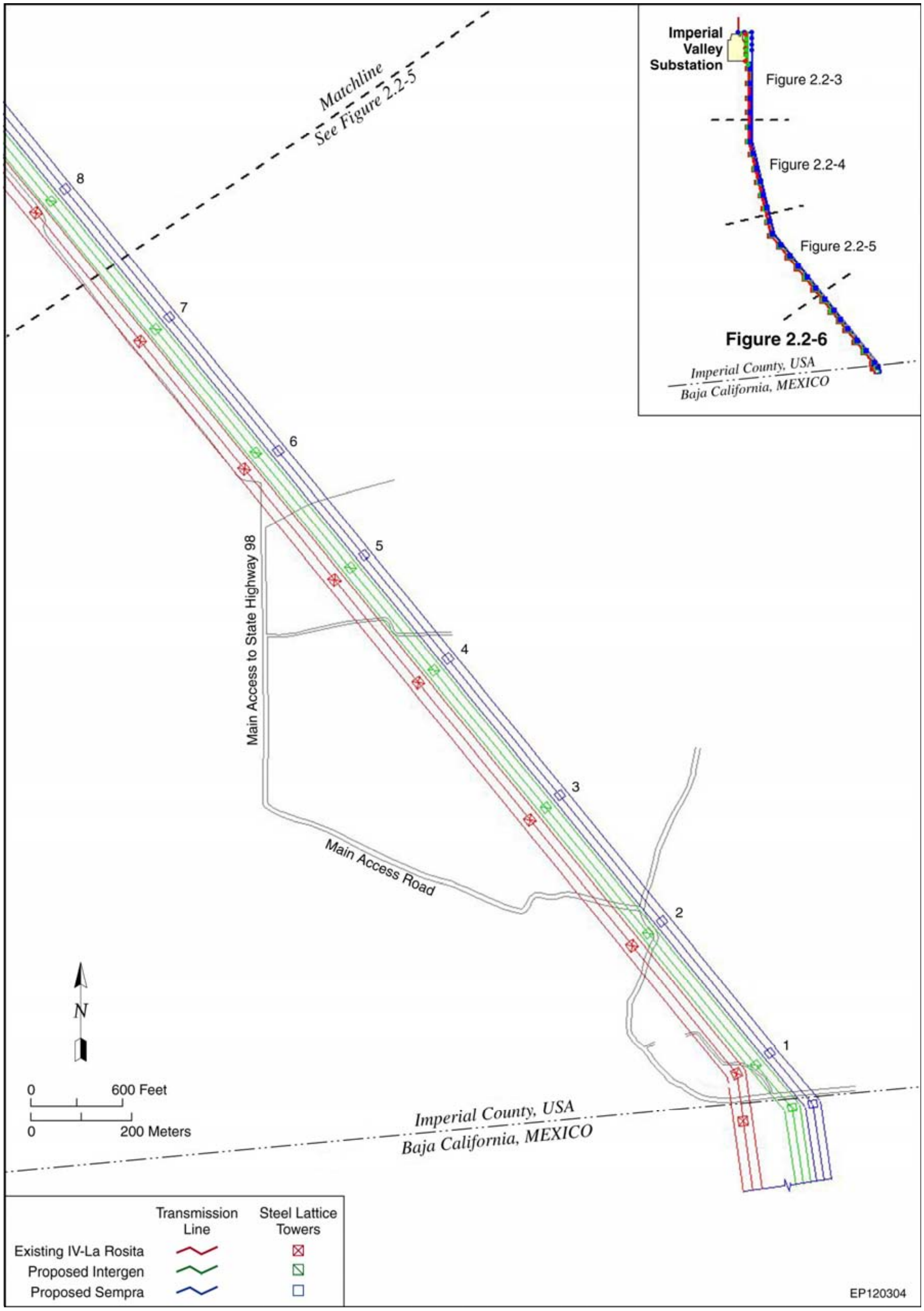

FIGURE 2.2-6 Projects' Plan — Segment D

for the Intergen transmission line would be adjacent to the existing 120-ft (37-m) ROW for the existing SDG&E transmission line and would also be 120 ft (37 m) wide, so that the centerline would be 120 ft (37 m) east of the centerline of the existing transmission line ROW. The centerline of the Sempra ROW would be east of and adjacent to the proposed Intergen transmission line ROW and would be 120 ft (37 m) wide. Thus, the centerline of the Sempra ROW would be 120 ft (37 m) east of the centerline of the proposed Intergen ROW and 240 ft (73 m) east of the centerline of the existing line.

For both the Intergen and Sempra transmission lines, steel lattice towers would be erected on the centerlines of the ROWs.[1] The towers would be spaced approximately 900 to 1,150 ft (274 to 350 m) apart and would be roughly in line with the existing line's towers in an east-west direction. In this EIS, the towers, the A-frames, and steel poles for both lines are referred to by consecutive numbers from south to north; Tower No. 1 would be the first tower north of the U.S.-Mexico border, and Tower No. 24 would be just south of the IV Substation. Similarly, the steel monopoles are referred to by consecutive numbers from south to north of the substation, with the A-frame crossing structures included in the pole numbering system as No. 2 and No. 3. All proposed features of the projects are shown in Figures 2.2-3 through 2.2-6.

2.2.1.1 Transmission Line Construction

Sempra and Intergen would use the same contractor to build both transmission lines simultaneously. Construction would begin with site preparation, consisting of grading of access roads, where necessary, and drilling or excavation for support structures and footings. Support structures would be fabricated in segments by the same vendor in Mexico. Each lattice tower and A-frame structure would be carried to the construction site by helicopter, which would minimize the amount of lay-down area required in the United States. Monopoles would be brought to the site by truck in sections, assembled in lay-down areas, and lifted into place with a crane. Principal preparation at each support structure location would consist of preparing concrete foundation footings. Each tower would require four footings, one on each corner; a single footing would be needed for each monopole.

Three types of steel lattice transmission towers and two types of steel monopoles would be used, depending on function. The three types of steel lattice towers are suspension, deflection, and dead-end; the two types of steel monopoles are suspension and deflection. Suspension towers (or monopoles) are used where cables are strung in a straight line from one tower to an adjacent one (Figures 2.2-7 and 2.2-8). Deflection towers (or monopoles) are used where transmission lines turn gradual angles (Figures 2.2-9 and 2.2-10), and dead-end lattice towers are used where transmission lines turn large angles or where a transmission line is brought into an electric substation (Figure 2.2-11). Suspension, deflection, and deadend towers are about 140 ft (43 m) high, and both deflection and suspension monopoles are about 102 ft (31 m) high.

[1] In some cases, the descriptions of tower dimensions and conductor spacing are slightly greater than the as-built dimensions. Thus, some of the estimates of land disturbance during construction are conservative.

Conductors (wires) on the dead-end and deflection towers or monopoles would be supported by double insulators. Conductors on suspension towers or monopoles would be supported by single insulators. The minimum ground clearance of the conductor would be 36 ft (11 m). The average horizontal distance between circuits for phase conductor spacing on steel lattice suspension and deflection towers would be approximately 35 ft (10.7 m). For dead-end steel lattice towers, the distance would be about 50 ft (15.2 m). The horizontal distance between phases on the steel monopoles would be about 26 ft (8.0 m) for the suspension monopole and 37.6 ft (11.5 m) for the deflection monopole. Vertical spacing between phases on a steel lattice tower would be between 21.3 ft (6.5 m) and 26.4 ft (8.0 m), depending upon the tower type. Vertical spacing between phases on steel monopoles would be 18.0 ft (5.5 m) for both monopole types.

Each support structure would contain two electrical circuits. Each electrical circuit consists of three phases with two unbundled conductors making up each phase. Two static ground wires would be located at the top of each support structure. These static ground wires would provide communications, system protection, and monitoring. The two ground static wires would include the installation of communications fiber for system protection and monitoring, with additional black fiber for future communications use. Therefore, each proposed transmission line would consist of 14 wires; that is, 12 conductors and the 2 static ground wires.

The conductors would be composed of strands of aluminum wire wrapped around a stranded steel cable. The aluminum conducts electricity and the steel supports the conductor. This type of construction is known as aluminum conductor steel-supported. Each conductor wire has a core of 7 steel wires surrounded by 54 aluminum wires.

The towers would be anchored to concrete foundations at each of the four corners at the base of the tower. The tower base dimensions would range from approximately 30 ft by 30 ft (9.1 m by 9.1 m) for suspension towers, to 40 ft by 40 ft (12.2 m by 12.2 m) for the deflection and dead-end towers. At the top, the suspension towers would be approximately 6.6 ft (2.0 m) square, the deflection towers would be approximately 7.5-ft (2.3-m) square, and the dead-end towers would be approximately 13-ft (4-m) square.

Steel suspension monopoles would be approximately 2.5 ft (0.8 m) in diameter at the base, tapering to approximately 1 ft (0.3 m) in diameter at the top. Steel deflection monopoles would be approximately 4.8 ft (1.5 m) in diameter at the base, tapering to approximately 2.1 ft (0.6 m) at the top. Steel monopoles would be anchored to a concrete foundation.

Each of the four legs of the A-frame structures used to cross the Southwest Power Link (Figure 2.2-12) would be bolted to a cylindrical concrete footing. A total of 32 footings would be needed for the four A-frames, with two A-frame structures on each side of the Southwest Power Link.

Once support structures are in place, conductors would be strung for the entire length of the transmission lines, from the northernmost support structure at the substation. Truck-mounted cable-pulling equipment would be used to string the conductors on the support structures. Cables would be pulled through one segment of a transmission line, with each segment containing several towers or monopoles. To pull cables, truck-mounted cable-pulling equipment would be placed alongside the tower or monopole, directly beneath the crossarm insulators (the “pull site”) at the first and last towers or monopoles in the segment of the transmission line. The conductors would be pulled through the segment of line and attached to the insulators. Then the equipment would be moved to the next segment, with the “front-end” pull site just used becoming the “back-end” pull site for the next segment.

At the crossing structure south of the Southwest Power Link, the static wires would be brought down the structure, placed in a trench to pass to the other side of the Southwest Power Link, and brought back up the crossing structure on the other side. The trench would be backfilled.

Construction would be completed by restoring disturbed ground surfaces to original contours. Spoil dirt excavated for the footings would be spread on the ground, on access roads, or taken off site for disposal in a permitted disposal site.

2.2.1.2 Areas of Construction Impact

Areas of permanent impact would be those areas where the surface of the ground would be permanently disturbed. Specifically, permanent impacts would occur where new access roads and footings or anchors for tower, monopole, or crossing structures are constructed. Temporary impacts would occur in areas where construction activity takes place but where restoration of the surface is possible. These areas would include the work areas used to erect the towers, monopoles, or crossing structures; pull sites; lay-down areas for the monopoles; and the trenches for the optical cables under the Southwest Power Link at the substation. In some places, areas of temporary disturbance would overlap.

Many areas of temporary disturbance, such as work areas around towers or poles and pull sites, would overlap at least partially; consequently, the total estimate for the temporary impact areas is overestimated and therefore conservative.

The areas of impact, permanent and temporary, from construction of the proposed projects are presented in Table 2.2-1.

2.2.1.3 Operations and Maintenance

Operations and maintenance requirements would include, but not necessarily be limited to, the following: (1) yearly maintenance grading of access roads; (2) insulator washing; (3) monthly on-ground inspection of towers, monopoles, and access roads by vehicle; (4) air or ground inspection as needed; (5) repair of tower or monopole components as needed; (6) repair

TABLE 2.2-1 Areas of Construction Impact

	Size of Impact (acres)[a]	
Impact Location	Temporary	Permanent
Lattice tower footing	NA[b]	0.23
Lattice tower access roads	NA	1.72
Lattice suspension tower work areas	2.46	NA
Lattice deflection tower work areas	0.88	NA
Lattice tower pull sites	0.83	NA
Area of substation impact[c]	9.5	NA
Monopole pull sites and work areas	0.48	NA
Monopole lay-down areas	1.21	NA
Optical line trenches	0.06	NA
Crossing structures footing	NA	<0.05
Monopole footings	NA	<0.04
Monopole access roads	NA	1.56
Total	15.42	<3.60

[a] Based on a total of 25 towers (the actual number built is 24); thus the actual disturbance would be less than that shown here. To convert acres to hectares multiply by 0.4047.

[b] NA = not applicable.

[c] The work area near the IV Substation would be subject to intensive disturbance. It is likely, however, that not all of this area would be disturbed.

or replacement of lines as needed; (7) replacement of insulators as needed; (8) painting monopole or tower identification markings or corroded areas on towers or monopoles; and (9) response to emergency situations (e.g., outages) as needed to restore power.

For most of these operations, equipment could use the access roads and no significant additional disturbance would occur. Transmission line conductors may occasionally need to be upgraded or replaced over the life of the line. Old cables would be taken down, and new cables would be strung on the insulators in an operation similar to the cable-pulling operation used to initially install the conductors. While the project access roads can be used for access, pull sites would also be required. The sizes and locations of these pull sites may vary, depending on the cable and equipment used, the methods used by the contractor, and the technology available at the time. For these reasons, the size and location of future temporary disturbance areas because of pull sites cannot be accurately estimated. In any event, such conductor replacement is infrequent.

2.2.1.4 Applicants' Proposed Environmental Protection Measures

Several features of the projects' design and construction methods are intended to reduce the amount of surface disturbance and therefore the potential impacts on environmental resources. These include locating the support structures (steel lattice towers, crossing structures, and steel monopoles) so that new access roads can be kept as short as possible; using existing access roads to the maximum extent possible; and using a helicopter to place lattice tower assemblies onto footings to reduce the amount of ground disturbance that would otherwise be caused by the use of lay-down areas and operation of cranes. In addition, the applicants would hire the same construction contractor to build both lines, further minimizing impacts by combining and coordinating construction activity, eliminating potential repeated impacts to the same area, and minimizing traffic flows.

The applicants would commit to stringent monitoring and mitigation requirements to protect biological, cultural, and paleontological resources. These measures are discussed in the following subsections.

2.2.1.4.1 Biological Resources. To protect BLM-designated sensitive species, including the flat-tailed horned lizard and the western burrowing owl, the applicants would institute a number of protective measures for the proposed projects.

There is a potential for flat-tailed horned lizards to be encountered during transmission line construction activities. To protect this species, mitigation measures consistent with those identified in the *Flat-tailed Horned Lizard Rangewide Management Strategy* (hereafter referred to as the Strategy; Flat-tailed Horned Lizard Interagency Coordinating Committee 2003) would be conducted. These measures include the following:

1. Construction would be scheduled to occur as much as possible during the flat-tailed horned lizard's dormant period — November 15 to February 15; BLM would approve the construction schedule before the start of construction.

2. A preconstruction worker education program would be developed and implemented. In addition, wallet-cards would be provided to all construction and maintenance personnel and would include information regarding the biology and status of the lizard; the protection measures that are being implemented; the function of the flagging around sensitive resources; reporting procedures if a lizard is found within the construction area; and methods of reducing impacts during commuting to and from construction areas.

3. A field contact representative (FCR) would be designated prior to the start of construction and approved by BLM. The FCR would be responsible for ensuring compliance with protective measures for the flat-tailed horned lizard and other sensitive biological resources and would act as the primary

resource agency contact. The FCR would have the authority to halt construction activities if the project is not in compliance with mitigation required by BLM.

4. The FCR would coordinate with the construction manager to assure that all surface-disturbing activities are located as much as possible in areas that have been previously disturbed or where habitat quality is lower, and where disturbance to biological resources can be minimized.

5. All work areas would be clearly flagged or otherwise marked, and all work would be restricted to these areas. All construction workers would restrict their activities and vehicles to areas that have been flagged or to clearly recognizable areas, such as access roads, that have been identified as "safe" areas by the FCR.

6. A Biological Monitor, hired by the applicants but authorized by BLM, would be present in each area of active construction throughout the workday, from initial clearing through habitat restoration, except where the project is completely fenced and cleared of flat-tailed horned lizards by a biologist (measure 12 below). The biologist must have sufficient education and field training with the flat-tailed horned lizard. This biologist would ensure that the project complies with these mitigation measures and would have the authority to halt activities if they are not in compliance. The biologist would inspect the construction areas periodically for the presence of flat-tailed horned lizards and would inspect any open trenches or pits prior to backfilling. The biologist would also work with the construction supervisor to take steps to avoid disturbing the lizards and their habitat. If a lizard is discovered within an affected area, the lizard would be captured and relocated by a biologist authorized by BLM to handle the lizards. The Biological Monitor would also excavate all potential flat-tailed horned lizard burrows within the construction areas and relocate any flat-tailed horned lizards encountered.

7. Only biologists authorized by BLM may handle flat-tailed horned lizards. Any workers who discover flat-tailed horned lizards would avoid disturbing the animals and would immediately notify their construction supervisor and the Biological Monitor.

8. The area of vegetation and soil disturbance would be minimized to the greatest extent possible. When possible, the equipment and vehicles would use existing surfaces or previously disturbed areas. When excavation or grading was necessary, the topsoil would be stockpiled and restored following completion of the work.

9. Existing roads would be used to the greatest extent possible for travel and staging areas.

10. If BLM desires, newly created access roads would be restricted by constructing barriers, erecting fences with locked gates, and/or by posting signs. Maintenance of access control facilities would be the responsibility of the applicants for the life of the project (construction and operation).

11. Sites where prolonged construction activity, lasting 6 hours or more, would occur, and in which lizard mortality could occur, may be enclosed with 0.5-in. (1.3-cm) wire mesh fencing to exclude the lizards from the site. This barrier fencing must be at least 12 in. (30.4 cm) above and below the ground surface, and all entry gates should be constructed to prevent lizard entry. Once a fenced site has been cleared of flat-tailed horned lizards and fenced in this manner, an on-site monitor would no longer be required. Fencing would not be required if a Biological Monitor is present.

12. For all areas disturbed by construction, a habitat restoration plan would be developed by a qualified biologist, approved by BLM, and implemented by the applicants. The restoration plan would include a schedule for monitoring and assuring the success of restoration, including the removal of invasive species, acceptable to BLM. The restoration plan would also include a minimum of 3 years of tamarisk and other exotics control following construction.

13. The FCR would keep a record of the extent of all areas permanently and temporarily disturbed by construction. This record would be the basis for determining any monetary compensation to be paid by the applicants to BLM upon the completion of construction as identified in the Strategy. BLM may require, prior to the beginning of construction, a reasonable deposit, on the basis of the extent of anticipated disturbance, with the final compensation to be determined according to the FCR's final record and the compensation formula in the Strategy.

For any construction occurring during the flat-tailed horned lizard's active period, before November 15 or after February 15, all of the measures listed above that are applicable would be implemented. In addition, the following measures would be required:

1. The FCR would coordinate with the construction manager for the applicants to assure that vehicular traffic is kept to a minimum, consistent with the practical requirements of construction.

2. Work crews would not drive to the work site in the management area in individual vehicles. The applicant would arrange for workers to park outside the management area and be driven together to the work site in single collection vehicles. This limitation would apply to the members of a work crew (two or more persons) who would be working together throughout the shift, except for emergencies.

3. The FCR and Biological Monitors would keep a record of all sightings of flat-tailed horned lizards and fresh flat-tailed horned lizard scat. Sightings would be reported in writing to BLM on a schedule established by BLM.

There is a potential that the proposed projects could impact active burrows of the western burrowing owl; the breeding season for western burrowing owls is between February 1 and August 31. Burrows can be occupied and active during both the breeding and nonbreeding seasons. To avoid impacts to the western burrowing owl, the following measures would be implemented as necessary:

1. Disturbance by construction of any occupied western burrowing owl burrows should be avoided. A nondisturbance buffer of 160 ft (49 m) during the nonbreeding season and 250 ft (76 m) during the breeding season would be maintained around each occupied burrow when possible. It is preferable that construction take place between September 1 and January 31, to avoid impacts to breeding western burrowing owls.

2. If construction is to begin during the nonbreeding season, a preconstruction clearance survey would be conducted within the 30 days prior to construction to identify whether any western burrowing owl territories are present within the project footprint. The proposed construction areas would need to be identified in the field by the project engineers prior to the commencement of the preconstruction clearance survey. The survey would follow the protocols provided in the *Burrowing Owl Survey Protocol and Mitigation Guidelines* (California Burrowing Owl Consortium 2001).

3. Passive relocation of western burrowing owls from occupied burrows that would be otherwise impacted by construction would be required. Passive relocation would only be implemented in the nonbreeding season. This would include covering or excavating all burrows and installing one-way doors into occupied burrows. This would allow any animals inside to leave the burrow but would prevent any animals from reentering the burrow. A period of at least 1 week is required after the relocation effort to allow the birds to leave the impacted area before construction of the area can begin. The burrows would then be excavated and filled in to prevent their reuse. An artificial burrow would be created beyond 160 ft (49 m) from the impact area but contiguous with or adjacent to the occupied habitat.

4. The destruction of the active burrows on site would require construction of new burrows at a mitigation ratio of 1:1, at least 164 ft (50 m) from the impacted area. New burrows would be constructed as part of the above-described relocation efforts.

5. If construction is to begin during the breeding season, the above-described measures would be implemented prior to February 1 to discourage the nesting of the western burrowing owls within the area of impact. As construction

continues, any area where owls are sighted would be subject to frequent surveys for burrows before the breeding season begins, so that the owls can be relocated before nesting occurs.

6. It is possible that these protocols would need to be repeated throughout the length of construction to ensure that additional burrowing owls have not moved within the areas of impact subsequent to the initial preconstruction clearance survey and relocation efforts. As the construction schedule and details are finalized, a qualified biologist would prepare a monitoring plan to detail the methodology proposed to minimize and mitigate impacts to this species.

The construction of the steel lattice tower portions of both the Intergen and Sempra transmission lines could impact nonwetland jurisdictional waters of the United States. To mitigate impacts to nonwetland jurisdictional waters, the following measures would be required:

1. Any areas of nonwetland jurisdictional waters temporarily impacted would be returned to preconstruction contours and condition.

2. Permanent impacts of 0.08 acre (0.03 ha) would be mitigated at a ratio consistent with Federal regulatory agencies, which is typically 1:1. A restoration plan would be prepared detailing the proposed mitigation for impacts to jurisdictional waters. It is recommended that enhancement of the survey corridor through removal of the nonnative invasive tamarisk be conducted. This would be conducted along the eastern edge of the IV Substation, which would account for an area of at least 0.10 acre (0.04 ha) in size. Additional tamarisk could be removed from the southern edge of the wetland area, if necessary. The restoration plan would require a minimum of 3 years of control for tamarisk and other exotics following construction to ensure that these species are not allowed to establish within the impacted areas.

3. In addition, impacts to these waters would require a Section 404 Permit from the U.S. Army Corps of Engineers and a 401 Certificate from the Regional Water Quality Control Board in accordance with the Clean Water Act (CWA). This project would be covered by Nationwide Permit No. 12, which regulates all activities required for the construction of utility lines and associated facilities within waters of the United States. This Nationwide Permit covers all projects that do not exceed 0.50 acre (0.20 ha) of impact resulting from construction of the utility lines and associated access roads. This project meets that threshold by impacting a maximum of 0.21 acre (0.08 ha) of jurisdictional waters.

2.2.1.4.2 Cultural Resources. To protect cultural resources, the applicants would agree to accept the following conditions to the grants of ROW with BLM:

1. Identification and evaluation of historic properties and resolution of adverse effects would be determined through consultation with BLM, the California State Historic Preservation Officer (SHPO), and consulting parties pursuant to Section 106 of the National Historic Preservation Act (NHPA) and implementing regulations at 36 CFR Part 800.

2. The applicants would assist BLM in consulting (pursuant to the NHPA) with Indian Tribes to determine whether there are properties of religious and cultural significance to the Tribes within the Area of Potential Effect. The applicants would document their consultation efforts and would provide this in writing to BLM. This documentation may be submitted as part of the cultural resource survey report or as an addendum to that report.

3. The applicants would implement the treatment plan for resolving adverse effects on historic properties, if any, that would be affected by the undertaking.

4. BLM would ensure that all historic preservation work is carried out by or under the direct supervision of a person or persons (the Principal Investigator) meeting, at a minimum, the standards set forth in the Secretary of the Interior's Professional Qualifications (48 FR 44738–44739).

5. Archaeological monitoring would be conducted for any subsurface construction or ground-disturbing activity in areas determined by the Principal Investigator and BLM to be archaeologically sensitive in accordance with a monitoring and discovery plan approved by BLM and the SHPO.

6. The Principal Investigator and Biological Monitors would attend a preconstruction meeting. The construction contract would state the need for the meeting, and project construction plans would be marked with requirements for monitoring. The meeting would allow the archaeological monitors to establish their roles and responsibilities, and protocol and point of contact information with the construction contractors.

7. Cultural properties discovered during construction would be reported and treated in accordance with a monitoring and discovery plan approved by BLM and the SHPO.

8. If human remains or funerary objects are discovered during construction, construction would cease immediately in the area of discovery, and BLM would be notified by telephone followed by written confirmation. In accordance with the monitoring and discovery plan and Native American

Graves Protection and Repatriation Act, BLM would notify and consult with Indian Tribes to determine treatment and disposition measures.

9. BLM would ensure that all materials and records resulting from the treatment program are curated in accordance with 36 CFR Part 79.

2.2.1.4.3 Paleontological Resources. To protect paleontological resources, the applicants would agree to accept the following conditions to the grants of ROW agreements with BLM:

1. A paleontologist, approved by BLM, would be retained prior to the beginning of construction and would be responsible for carrying out the mitigation program.

2. The consulting paleontologist would review project plans and site information and determine those areas of the site where excavations may have the potential to encounter significant fossils (areas of paleontological sensitivity).

3. Areas of paleontological sensitivity would be monitored when excavations or any other activities that could expose subsurface formations are occurring. Paleontological Monitors, approved by the consulting paleontologist, would monitor such activities. Areas of paleontological sensitivity would be marked on project plans used by the construction contractor.

4. The consulting paleontologist would attend at least one preconstruction meeting with the construction contractor to explain the monitoring requirements and procedures to be followed if fossils are discovered.

5. The construction contractor would keep the consulting paleontologist informed of the construction schedule and would perform periodic inspections of construction.

6. In the event that fossils are discovered, the Paleontological Monitor would immediately inform the consulting paleontologist. The monitor would have the authority to temporarily halt, redirect, or divert construction activities to allow the recovery of fossil material.

7. Any fossil materials collected would be cleaned, sorted, and cataloged and then donated to an institution approved by BLM with a research interest in the materials.

8. Within 6 weeks of the completion of construction, the consulting paleontologist would prepare a report on the results of the monitoring effort

and would submit the report to BLM, and, if fossils have been recovered, to the institution to which the fossils have been donated.

2.2.1.5 Alternative Transmission Line Routes

The identification of potential transmission line routes includes routes on Federal and private lands that would connect the IV Substation with lines from Mexico at the U.S.-Mexico border. BLM lands extend more than 20 mi (32 km) to the west of the existing 230-kV IV-La Rosita transmission line (hereafter, existing line) route, and private lands are within 1 or 2 mi (2 or 3 km) of the route to the east. Utility Corridor N, designated in the BLM CDCA Plan (BLM 1999), is identified as an appropriate location for utility lines. This corridor also allows a more direct route between the IV Substation in the United States and the La Rosita Substation in Mexico. Two alternative transmission routes to the applicants' proposed routes are evaluated in this EIS (Figure 2.2-13). A third alternative route located mostly on private land east of the existing line was considered but not evaluated for the reasons given below.

The end point and start point of each alternative route is at a fixed geographical location, namely the IV Substation to the north and the U.S.-Mexico border immediately east of where the existing line crosses the U.S.-Mexico border. The applicants' proposed routes represent a relatively direct path between these points.

2.2.1.5.1 West of the Existing 230-kV Transmission Line. An alternative route west of the existing 230-kV IV-La Rosita transmission line (Figure 2.2-13) was evaluated. The location of the western route was selected to minimize the amount of land with sensitive cultural resources that would have to be crossed by the transmission lines. This route would require 7.4 mi (11.9 km) of ROW entirely on BLM land. The southern portion of this route would extend to the west, outside of BLM-designated Utility Corridor N. Any alternative route outside the corridor could require a BLM Plan Amendment. Under this alternative, the Intergen and Sempra transmission lines would make a 90-degree turn to the west, then turn northeast to connect to the IV Substation. If the Intergen and Sempra lines were routed west of the existing line, these two new lines would have to cross over or under the existing line. The crossing of the existing transmission line would add considerable expense to construction and maintenance costs, as well as likely result in an increase in the number of towers required to be constructed on the U.S. side, and thus in the area temporarily and permanently impacted by construction.

2.2.1.5.2 East of the Existing 230-kV Transmission Line. An alternative route east of the existing line on the eastern boundary of BLM-managed land was also analyzed (Figure 2.2-13). The rationale for selecting the location of this route was to avoid concentrations of archaeological resources along the former shoreline of Lake Cahuilla and also to attempt to reduce biological effects by constructing the lines on the border of the Yuha Basin ACEC rather than through it. The eastern alternative route would require 5.8 mi (9.3 km) of ROW. This location, like the applicants' proposed routes, would remain entirely on BLM land within Utility Corridor N.

The Intergen and Sempra lines would make a 90-degree turn to the east along the border to the eastern boundary of BLM lands, then turn northwest along the eastern property boundary of BLM lands to the IV Substation.

2.2.1.5.3 Outside Federal Lands. An additional alternative route was considered in which the transmission lines would be located primarily on private lands located east of BLM-designated Utility Corridor N. To reach the IV Substation, this alternative route would traverse a little more than a mile in Federal lands.

Routing the transmission lines through private land to the east would require a considerably longer route than the more direct eastern, western, and applicants' proposed routes. Such a route would be more costly to construct and would result in a greater amount of ground disturbance than the other proposed routes. A larger number of towers would be required to be constructed, expanding any area temporarily or permanently impacted by construction; also, more materials, fuels, and expendables would be consumed.

Most important, private lands to the east are being used for agriculture. Any such alternative route would displace some agricultural land under towers and/or around monopoles and create conflicts with aerial crop dusting and other agriculture practices. Further, the acquisition of ROWs on private land would prove difficult to justify with regard to a variety of issues, including economic, environmental, and resource consumption, and it would be regarded as an unnecessary impingement on valued land when less expensive, shorter, and less intrusive routes are available on Federal lands through an existing, predesignated utility corridor.

This alternative route was not considered to be reasonable; no substantive advantage could be discerned to weigh against its considerable disadvantages; therefore, it was not analyzed further.

2.2.2 Project-Related Power Plants

Figure 2.2-14 is a schematic showing the generalized engineering features of the TDM and LRPC power plants as described in Chapter 1. The following sections further describe specific characteristics of each power plant.

All generating units at both power plants operate in a combined-cycle mode and are fueled by natural gas supplied by a cross-border pipeline previously permitted by FERC. Electricity is produced by both the gas turbines

La Rosita Power Complex

EAX:
- 3 Siemens-Westinghouse Model W501F combustion turbines
- Alstrom steam turbine
- Doosan heat recovery steam generator

EBC:
- 1 Siemens-Westinghouse Model W501F combustion turbine
- Alstrom steam turbine
- Foster Wheeler heat recovery steam generator

> **Termoeléctrica de Mexicali Power Plant**
>
> - 2 General Electric Model 7FA combustion turbines
> - Alstrom steam turbine
> - Cerrey heat recovery steam generator

and the steam turbine generators. Exhaust gases from the gas turbine are cleaned up during their travel through the heat recovery steam generator. Heat from the gas turbine exhaust, which would otherwise be released to the atmosphere with exhaust gases, is recovered by the heat recovery steam generator to produce steam, which, in turn, is used by the steam turbine to generate additional electricity. Appendix L contains photographs of both power plants.

All turbines at both power plants are equipped with dry low-NO_X burners that control emissions of NO_X during combustion. All turbines at both power plants would also eventually utilize an SCR system to further control NO_X emissions. SCR (Figure 2.2-15) is a postcombustion cleaning technology that chemically reduces NO_X (nitrogen [NO] and nitrogen oxide [NO_2]) into molecular nitrogen and water vapor. A nitrogen-based reagent, such as NH_3, is injected either as a gas or liquid into the ductwork, downstream of the combustion turbine. The waste gas from the combustion turbine mixes with the reagent and enters a reactor module containing a catalyst. The hot flue gas and reagent diffuse through the catalyst, and the reagent reacts selectively with the NO_X. Unreacted NH_3 in the flue gas downstream of the SCR reactor is referred to as NH_3 slip. As the catalyst activity decreases, NO_X removal decreases and NH_3 slip increases. When NH_3 slip reaches the maximum design or permitted level, new catalyst must be installed. The NO_X removal efficiency of SCR ranges between 85 and 90%.

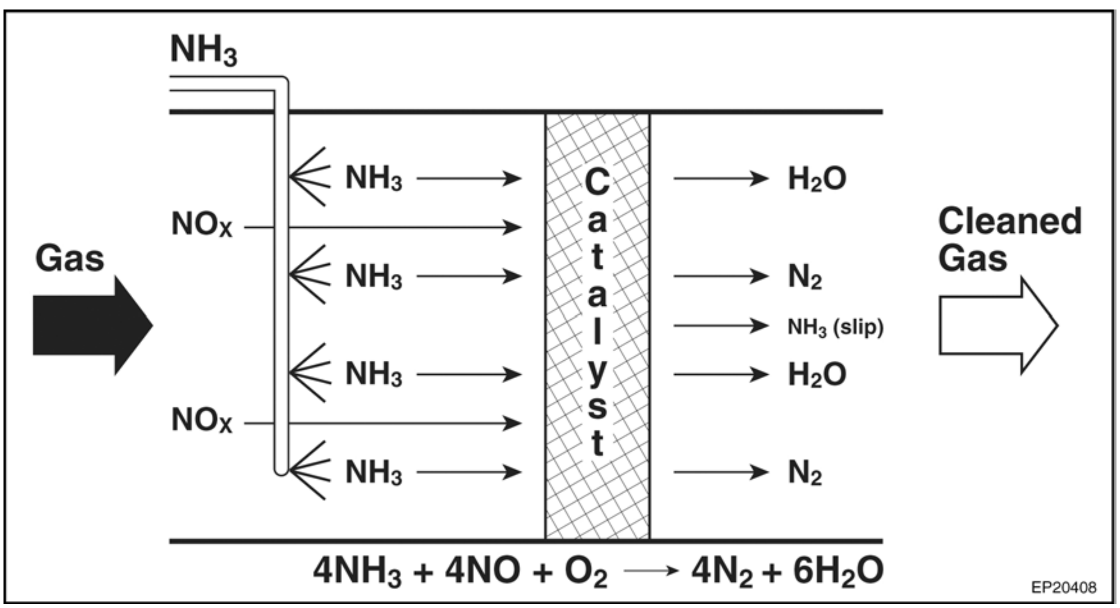

FIGURE 2.2-15 Schematic of Typical SCR System

Both the LRPC and TDM power plants use wet cooling systems. The wet cooling system consists of a surface condenser and a cooling tower. Figure 2.2-16 is a schematic of a wet cooling system. Because water used to produce steam in the steam turbine is demineralized and free of scale-forming material, it is in an open circulating system and reused in the steam turbine. Exhaust steam from the steam turbine is condensed by water circulating in the surface condenser. Demineralized makeup water is introduced to the steam cycle to replenish water lost as heat recovery steam generator blowdown and miscellaneous water and steam losses. The water in the surface condenser is then cooled by air flowing through the cooling tower(s) and the water is recirculated. Water is lost by evaporation in the cooling tower and must be replenished with "makeup water." Cooling towers are characterized by the means by which air is moved. Mechanical-draft cooling towers rely on power-driven fans to draw or force the air through the tower. Natural-draft cooling towers currently installed at the Sempra and Intergen plants use the buoyancy of the exhaust air rising in a tall chimney to provide the draft. A fan-assisted natural-draft cooling tower employs mechanical draft to augment the buoyancy effect. To reduce the demand for cooling water, the power plants could be retrofitted with a wet-dry cooling system; such a system is described in Section 2.3.1.

The Importance of Power Plant Cooling Systems

Effective cooling systems are critical to the operation and efficiency of gas-fired combined cycle power plants such as those at the LRPC and TDM. In this type of power plant, heat from the combustion process is recovered to generate steam that produces additional electricity. This process results in lower fuel use and lower air emissions for each megawatt hour of power generated. Figure 2.2-16 shows the power cycle for a typical combined-cycle power plant. Hot gases from the combustion of natural gas are used to drive a turbine that produces electricity. In a combined-cycle plant, exhaust gases from the combustion turbine are directed to a heat recovery steam generator in which waste heat from the exhaust gases is used to convert water to steam in a closed system. In addition, this process also cools the exhaust gases from the combustion turbine. The steam is used to drive a turbine to produce additional electricity. After passing through the steam turbine, the steam must be cooled (or condensed) back to a liquid state before being returned to the heat recovery steam generator to repeat the cycle. At the LRPC and TDM plants, the steam is cooled in a condenser using water as the medium for heat transfer. After heat is transferred from the steam side to the cooling side of the condenser, the cooling water passes through cooling towers that transfer the waste heat to the atmosphere (a process that results in evaporation of a portion of the water). The consumption of cooling water by evaporation is the single largest water loss at these power plants.

The processes and equipment at the TDM and LRPC power plants have been designed to operate within specified temperature ranges. If the cooling systems do not maintain the proper operating temperatures, the plant generating efficiency is reduced and the equipment may fail.

Water (both cooling and steam cycle) for both power plants is obtained from the Zaragoza Oxidation Lagoons located west of Mexicali (Figure 2.2-17). The primary source of water entering the lagoons is municipal sewage. Minor sources include storm water runoff and industrial discharge water (both process and sewage). The Zaragoza facility receives and treats approximately 33,200 ac-ft/yr of sewage water (an acre-foot [ac-ft] of water is the volume of water that covers 1 acre [43,560 ft] to a depth of 1 ft [0.30 m]). The sewage water is processed at the Zaragoza facility in up to 13 lagoons or settling ponds. It is a primary treatment process in which solids are settled out before the water is discharged into the New River through drainage channels managed by the Comisión Nacional del Agua.

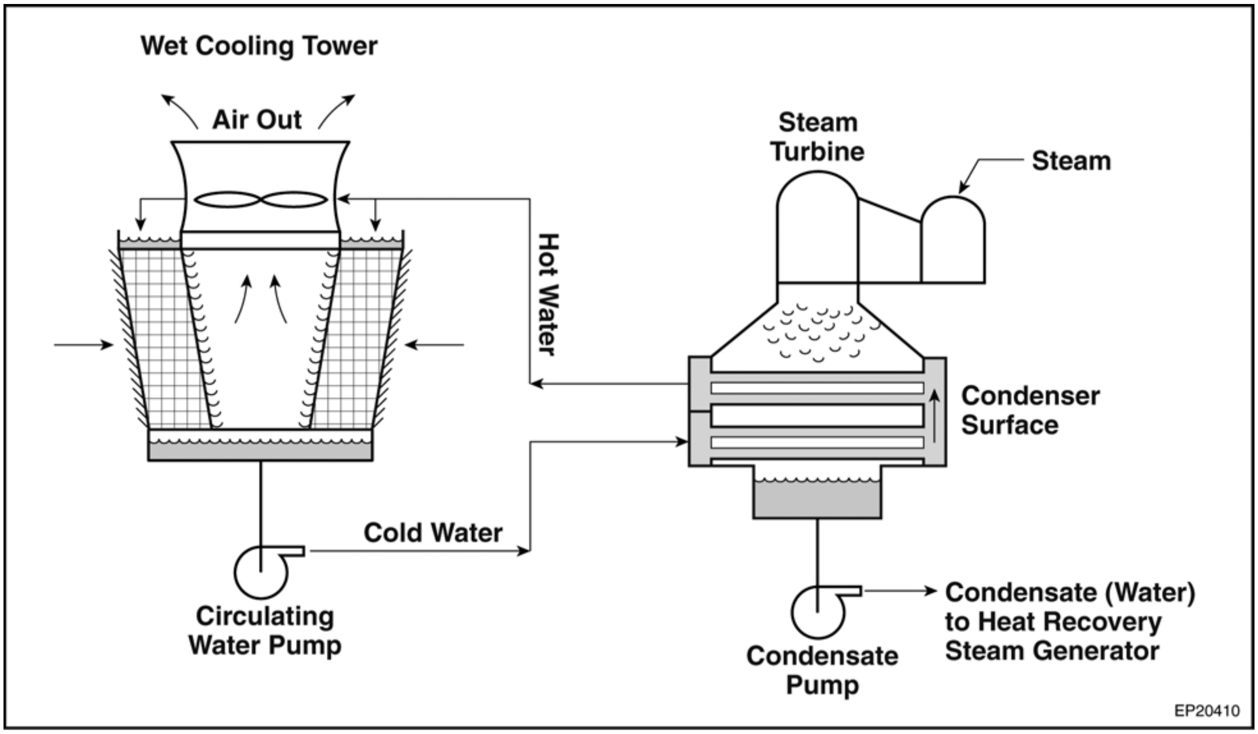

FIGURE 2.2-16 Wet Cooling Technology (Source: adapted from CEC 2001)

Water Treatment for LRPC. The LRPC contracts with the local Mexican municipal water authority, Comisión Estatal de Servicios Públicos de Mexicali (CESPM), to provide untreated, municipal wastewater. Raw sewage water is obtained at the inlet of the Zaragoza Oxidation Lagoons and piped to a sewage treatment plant adjacent to the lagoons that treats the water for use at the LRPC. Consequently, the water input to the sewage treatment plant has undergone little, if any, settling action from the lagoons. The adjacent sewage treatment plant treats the raw sewage via screening, degritting, degreasing, biological treatment via an extended aeration-activated sludge process (known as Orbal aeration, a process developed by U.S. Filter), nitrification-denitrification, final clarification, and chlorine disinfection. The sludge is dewatered and disposed of as nonhazardous waste. The treated water is pumped and piped approximately 5.2 mi (8.3 km) to the LRPC. Because it is critical to meet the water demands of the LRPC, the sewage treatment plant is expected to operate at flow rates somewhat higher than the demands of the power plants. Excess treated water (up to 1 ft^3/s) is discharged to a channel adjacent to the sewage treatment plant. This stream eventually combines with the effluent of the Zaragoza Oxidation Lagoons.

Next to the LRPC, a tertiary water treatment system has been constructed to further treat the water to reduce phosphates, dissolved organic matter, and heavy metals. Part of the water treatment process includes passing through a lime softener and clarifier. This process removes dissolved salts (e.g., calcium, magnesium, and phosphate) from the water obtained from the Zaragoza Oxidation Lagoons. The addition of lime causes the precipitation of calcium and magnesium, thereby removing much of the water's hardness, as well as substantial amounts of alkali metals, heavy metals, and phosphate. This process is the principal mechanism for reducing the quantity of TDS present in the water. The precipitated sludge is flocculated and separated from the water by sedimentation in the clarification process and sent to a press and filter house. Sludge from lime softening is dewatered and disposed of in an off-site landfill as nonhazardous waste.

Treated and untreated wastewater streams collected from power plant operations are discharged to the drainage channel that eventually connects to the Drenaje de Internationale, a major drainage channel flowing to the east, parallel to the U.S.-Mexico border (Figure 2.2-17). The Drenaje de Internationale empties into the New River within 100 yd (91 m) (Kiernan 2004) of the border, about 6 mi. (10 km) from the original discharge point. In the LRPC cooling towers, water is used up to five cooling cycles before it is discharged.

Water Treatment for TDM. The TDM power plant obtains water from the Zaragoza Oxidation Lagoons after the water is treated in the primary settling ponds. The TDM sewage treatment plant uses a biological treatment process to first oxidize organic matter and NH_3 in an aerobic step (in the presence of air following aeration), and then remove nitrates formed by NH_3 oxidation by bacterial action under anaerobic conditions (in the absence of air) in a second step, incorporating an activated sludge process with nitrification-dentrification. This treatment process eliminates biological contaminants and reduces other contaminants in the water. After biological treatment, water is clarified by the addition of lime to raise the pH to cause the precipitation of dissolved minerals, such as calcium and magnesium, and to reduce the concentrations of TDS that are present. The clarified water is then adjusted to neutral pH with the addition of sulfuric acid and disinfected through the addition of chlorine. The precipitated sludge settles out, thickens, and finally dehydrates on a belt press to produce a solid, nonhazardous waste, which is hauled to a landfill in Mexico. The water so treated is suitable for use as cooling water, the major use of water at the power plant. It replaces water lost to evaporation from the cooling towers.

A portion of this water is further treated to high purity for use in the closed steam cycle portion of the plant. This treatment is accomplished through coagulation of suspended solids using ferric chloride, filtering though sand and cartridge filters, and passage through a reverse osmosis system, which employs a semipermeable membrane to remove the smallest particles and much of the remaining dissolved matter. The water is finally treated in a demineralizer to remove the remaining dissolved matter. This water provides makeup water in the steam cycle as well as potable water for the plant.

Three main waste streams are piped into the waste sump during normal power plant operation. Waste streams mix before being discharged untreated into a drainage channel (the Drenaje de Internationale) that eventually leads to the New River (Figure 2.2-17). The first stream is the wastewater from the cooling tower. The cooling tower bank consists of 12 units, and the water is used for up to six cycles before it is discharged. The second stream is wastewater from the demineralization process. The third stream is water discharged from the steam cycle.

At times when the TDM power plant is not producing energy under normal conditions, the sewage treatment plant operates in the bypass mode; that is, water from the Zaragoza Oxidation Lagoons is treated in the biological treatment portion of the sewage treatment plant and then discharged into the drainage channels. This is necessary because the biological treatment part of the sewage treatment plant must operate at all times to maintain the microorganisms in the biological reactor. If the microorganisms would die, the sewage treatment plant would require 4 to 6 weeks to restart operations.

2.3 ALTERNATIVE TECHNOLOGIES

Under this alternative, DOE and BLM would grant one or both Presidential permits and corresponding ROWs to applicants who would build transmission lines that connect to power plants that would employ an alternative cooling technology and more efficient emissions controls.

2.3.1 Alternative Technologies Considered But Not Evaluated

2.3.1.1 Dry-Only Cooling Technology

There are two types of dry cooling systems: direct dry cooling and the lesser used indirect dry cooling. In both systems, fans blow air over a radiator system to remove heat from the system via convective heat transfer (rather than using water for cooking or evaporative heat transfer). In the direct dry cooling system, also known as an air-cooled condenser system, steam from the steam turbine exhausts directly to a manifold radiator system that releases heat to the atmosphere, condensing the steam inside the radiator.

Indirect dry cooling uses a secondary working fluid (in a closed cycle with no fluid loss) to help remove the heat from the steam. The secondary working fluid extracts heat from the surface condenser and flows to a radiator system that is dry cooled (fans blow air through the radiator to remove heat from the working fluid). An indirect dry cooling system is more complex and less efficient than a direct dry cooling system; for this reason, it is also less common. An indirect dry cooling system also produces no environmental advantages over a direct dry cooling system. For these reasons, the dry cooling system discussed in the following paragraphs refers only to a direct dry cooling process.

Dry-only cooling technology is considered here mainly as a means of reducing the amount of water necessary for cooling at the power plants in Mexico (thereby reducing the impacts to the New River and Salton Sea caused by flow reductions under wet cooling). Under this scenario, the LRPC and TDM plants would be retrofitted with a dry-only cooling system.

A dry-only cooling system is usually used in situations when not enough water is available for wet cooling and the economics of the project can withstand the increased cost and loss of performance caused by its use (the use of dry cooling means less electricity will be produced with the steam produced, and thus more fuel per unit of electricity produced will be consumed). Loss of performance is especially pronounced when the daily mean maximum temperature exceeds 80°F (27°C), to the extent that dry cooling alone is considered impractical at temperatures above this threshold (Simões 2004b).

Dry-only cooling technology would be an insufficient cooling process for the Mexico power plants for the following reasons:

- In the region, maximum daily temperatures are less than 80°F (27°C) only 37% of the time [NOAA 2003]). Temperatures exceed 80°F (27°C) about 63% of the time, and these high-temperature months tend to coincide with high-electricity-demand months. For plants in this climate condition, wet cooling is necessary for most of the year in order to maintain output and plant efficiency.

- Because the power plants have already been constructed, retrofitting for dry cooling would be extremely costly. For example, Sempra has estimated that it would cost approximately 150 million (43% of the original cost of the plants) to retrofit a dry cooling system. There would also be significant costs associated with shutting down the facilities for the 4 to 5 months needed for retrofit construction (Simões 2004b,c).

Dry-only cooling technology is considered infeasible as a retrofit to the existing plants on the basis of its low efficiency in the climate of the power plants and the high cost of redesigning the facilities, replacing equipment, and shutting down the facilities for the duration of retrofit construction. Therefore, it is not evaluated further in this EIS as a reasonable alternative technology for Alternative 3.

2.3.1.2 Zero-Liquid Discharge Water Management Technology

Zero-liquid discharge water management systems are used at steam electricity-generating stations to minimize cooling system wastewater production by reusing as much wastewater as possible within the plant and employing evaporation to eliminate the remaining wastewater. The technology is considered here mainly as a means of reducing discharges of TDS from the power plants in Mexico. Under this scenario, the LRPC and TDM plants would be retrofitted with sidestream softening and reverse osmosis systems to reduce the required amount of cooling tower blowdown (the largest contributor to wastewater). Cooling system wastewater would be discharged to solar evaporation ponds or mechanical-evaporator crystallizers located at each site. This would evaporate the water so that little, if any, wastewater would be discharged to the New River. Appendix K provides additional design (and retrofit) details on this type of system.

The water quality impacts of installing zero-liquid discharge technology are mixed. Calculations show that this technology would decrease TDS and phosphorus concentrations in the New River at the U.S.-Mexico border by about 1%, but it would slightly increase concentrations of total suspended solids (TSS), biochemical oxygen demand (BOD), chemical oxygen demand (COD), and selenium compared with both plants operating without this technology (Appendix K). Flows to the New River would be slightly less than those under the proposed action, since wastewater discharge would be eliminated.

Because the retrofit of a zero-liquid discharge system to the power plants would present several technical challenges and incur significant capital and operating costs yet yield only minimal water quality benefits, this technology is not evaluated further in this EIS as a reasonable alternative technology for Alternative 3.

2.3.2 Wet-Dry Cooling Retrofit

Because the power plants have been constructed with wet cooling systems, another possible alternative cooling technology is to retrofit the plants with a wet-dry cooling system, which combines both wet and dry cooling technologies (Figure 2.3-1). This section will discuss the feasibility of retrofitting the plants with wet-dry cooling.

The most common dry-cooling technology is direct dry cooling, also known as an air-cooled condenser system. In dry cooling, fans blow air over a radiator system to remove heat from the system via convective heat transfer (rather than using water for cooling or evaporative heat transfer). Steam from the steam turbine exhausts directly to a manifold radiator system that releases heat to the atmosphere, thus condensing the steam inside the radiator (see the dry section illustrated in Figure 2.3-1).

A wide range of wet-dry cooling designs is possible, covering the entire spectrum of wet versus dry cooling components depending on plant needs. A typical wet-dry cooling system utilizes both an air-cooled condenser and a wet evaporative cooling tower within the same cooling system. Wet-to-dry cooling ratios would depend on the prevailing ambient air

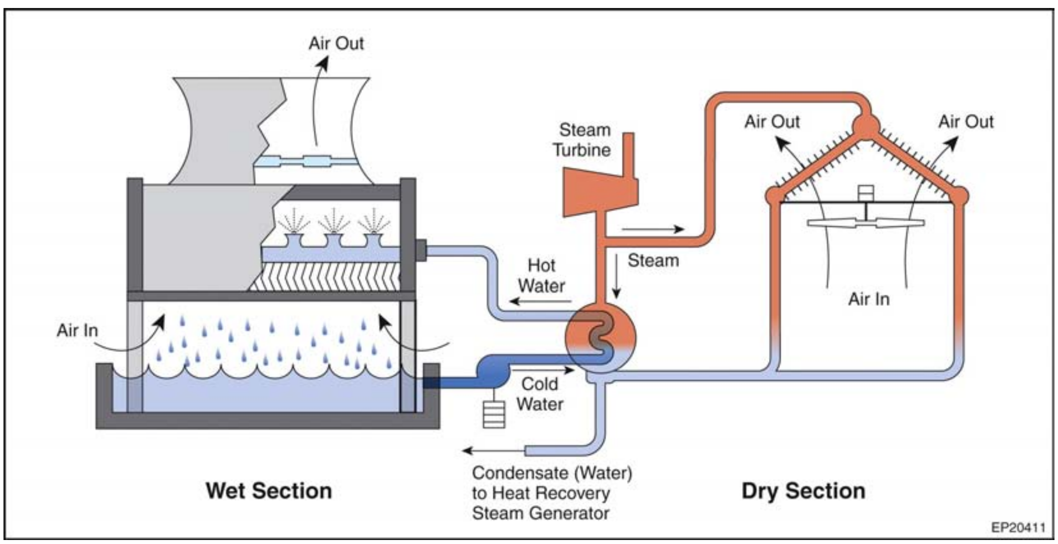

FIGURE 2.3-1 Wet-Dry Cooling Technology (Source: adapted from Institute of Clean Air Companies 1997)

temperatures and humidity. A wet-dry system is sometimes called a "water conservation design" or a "parallel condensing cooling system." Wet cooling would be used during hot weather, while dry cooling would be used most other times.

Dry cooling has both advantages and disadvantages compared to wet cooling. Advantages of dry cooling may include:

- Significant decrease in water required for dry cooling compared with wet cooling. Typically, dry cooling systems use 90 to 95% less water than power plants with wet cooling systems.

- Minimal use of water treatment chemicals, since air is used in the air-cooled condenser and not water like in the wet cooling tower.

- Minimal generation of liquid and solid wastes, since water impurities requiring disposal are not generated in the air-cooled condenser as they are in a wet evaporative cooling tower.

- No visible water vapor plume, which is present with wet cooling technology during certain meteorological conditions.

- Lower water consumption, that is, 90 to 95% less water would be purchased and treated.

The disadvantages of dry cooling may include:

- Air-cooled condensers can have a negative visual effect because they are often taller than wet cooling towers.

- Decreased efficiency in hot weather compared with wet evaporative cooling.

- Disturbance of a larger land area for the air-cooled condensers than is required for wet cooling towers.

- Greater noise impacts than wet cooling systems because of the greater number of fans and the considerably greater total airflow rate. However, new quieter fans and other mitigation measures are available to reduce these impacts.

- A reduction in power plant steam-cycle efficiency and output, depending on site conditions and seasonal variations in ambient conditions. The efficiency reduction ranges from about 2% when the ambient temperature is 68°F (20°C), to about 8% when the ambient temperature is 104°F (40°C). When factoring in the extra power needed to operate the cooling fans, efficiency could be reduced by a total of 10 to 15% (DOE, NREL, and ANL 2002). For a typical combined-cycle power plant where the steam cycle accounts for about one-third of the total capacity, overall plant efficiency would be reduced from between 3 to 5%.

- Increased capital and operating and maintenance costs with a dry cooling system.

Application of a wet-dry cooling system allows tailoring the use of either the wet or dry system on the basis of climatic conditions. The issues in deciding whether to retrofit a wet-dry cooling system on both facilities would involve estimating the amount of time the plants would operate in the water-conserving dry cooling mode and the feasibility of adding the necessary equipment, in terms of both equipment cost and the difficulty of integrating the technology into the existing plant.

A potential wet-dry cooling system design would use dry cooling to handle the entire cooling load up to an ambient temperature of 80 to 90°F (27 to 32°C). Wet cooling would augment the dry system at temperatures above 80 to 90°F (27 to 32°C); 100% wet cooling could be used on days the temperature is above 90°F (32°C) to ensure maximum power output from the plants (Powers 2004b). The analysis of impacts to water resources assumes that dry cooling will be used at temperatures up to 90°F (32°C).

An analysis of data on maximum daily temperatures in Imperial, California, from 1993 to 1999 shows that 37% of the daily maximum temperatures are below 80°F (27°C); 19% are between 80 and 90°F (27 and 32°C); and 44% are more than 90°F (32°C) (NOAA 2003). Therefore, dry cooling only would be expected to be used 37% of the time while some combination of wet-dry or wet-only cooling would be used 63% of the time.

Retrofitting an existing plant to utilize wet-dry cooling would involve solving a number of possibly complex system integration issues, such as whether there is enough properly situated space to accommodate dry cooling equipment. Dry cooling towers are very large in both height and width; a retrofit at these plants would require an area as much as about 7 acres (3 ha) (Simoes 2004b). The cooling towers would also have to be located close to other large structures at the plants, like a turbine hall or heat recovery steam generator, which could negatively affect their performance due to wind effects caused by the interaction between structures; often the larger the tower, the greater the negative effects. Properly locating equipment is best performed during the plant’s planning and design stage, not in a retrofit situation.

Costs associated with the retrofit would also have to be considered. They are estimated at $75 million (Simões 2004b) and include the capital cost of the new equipment, additional engineering and design costs, greater operation and maintenance costs, and the cost of lost power sales during installation. The outage due to installing the new equipment is estimated to be about 4 to 5 months.

A successful wet-dry cooling retrofit was performed in 1995 on a pulverized coal-fired power plant (Streeter Street Station Unit 7) owned by Cedar Falls Utilities in Cedar Falls, Iowa. However, this plant is very small, about 37 MW, and located in a cold climate. Extrapolating this experience for either the TDM or LRPC plants would be greater than a 10-fold increase. For smaller stations, like Streeter, the size and complexity are less challenging. Such a large extrapolation would be unprecedented, especially in light of the demanding temperatures in Mexico (Burns 2004).

2.3.3 Carbon Monoxide Emissions Control

This alternative includes operation of two power plants equipped with SCR to reduce NO_X emissions and the use of oxidizing catalysts on all gas turbines to reduce CO emissions.

The following is a description of a generic CO control system. CO is emitted when natural gas is not combusted completely. CO emissions in power plants are often controlled with an oxidizing catalyst. A honeycomb-like structure containing the catalyst is placed in the flue gas ductwork. The catalyst is made of precious metals, such as platinum and palladium, which act to promote a chemical reaction to transform CO to carbon dioxide (CO_2). This system can also reduce other hydrocarbons caused by incomplete combustion. These hydrocarbons combine with oxygen to form water and CO_2. For effective reduction of CO and hydrocarbons, the flue gas must be lean (i.e., have excess oxygen) to promote the reactions.

2.4 MITIGATION MEASURES

Under this alternative, DOE and BLM grant one or both Presidential permits and corresponding ROWs to authorize transmission lines whose developers would employ off-site mitigative measures to minimize environmental impacts in the United States. For offsets of air emissions from power plant operations, DOE contacted the Imperial County Air Pollution Control District (ICAPCD) and the Border Power Plant Working Group to obtain suggestions for off-site mitigation measures that could be evaluated under this alternative (Russell 2004; Poiriez 2004a,b,c; Pentecost and Picel 2004; Powers 2004a).

2.4.1 Water Resources

Mitigation for water resource impacts would focus on potential mitigation measures that could be implemented in the United States to offset increased TDS concentrations in the Salton Sea and/or New River resulting from reduced flow volumes in the New River due to power plant operations. The potential mitigation measures would be designed to offset the annual loss of 10,677 ac-ft (0.41 m^3/s) of water under the proposed action (i.e., both plants operating 100% of the time)[2] and could include the following:

- ***Lining canals:*** An estimated 167 mi (269 km) of canal in the Imperial Valley, if available to be lined, would need to be lined to offset the annual loss of water under the proposed action. Concrete liners installed along this length of

[2] Because the plants would not operate 100% of the time, water reductions and hence mitigation for such reductions are overestimated.

canal would cost an estimated $18 million; the addition of synthetic liners to reduce water seepage as the system ages would raise the cost to $22 million.

- ***Reducing Evaporative Losses:*** Replacing most of the canal system with pipe could offset the annual water loss under the proposed action by reducing the volume of water lost from the drainage system due to evaporation (about 11,600 ac-ft [0.45 m^3/s]). This measure would require replacing the entire approximately 1,667 mi (2,683 km) of canals and laterals in the IID system with pipe.

- ***Fallowing Farmland:*** The area of land needed for fallowing to offset water reductions under the proposed action would depend on the particular crop being fallowed since irrigation needs vary by crop. For a crop like corn, which requires about 2 ac-ft (7×10^{-5} m^3/s) of water per year, 5,340 acres (2,161 ha) would need to be fallowed, with the annual cost of fallowing about $7 million.

- ***Groundwater Transfer:*** Groundwater wells could be installed to pump groundwater to the New River or Salton Sea directly. This potential measure would require pumping about 30 wells at a rate of 220 gal/min (830 L/min), possibly at Imperial East Mesa. Studies would be needed to determine whether this pumping rate could be achieved and sustained for the term of the project.

- ***Salton Sea Mitigation Strategies:*** Offsets could possibly be achieved by installing a dike in the Salton Sea to reduce the annual evaporation in the main body of the Sea. Another potential strategy would be to annually remove a volume of water from the Sea to compensate for losses from the New River. Both strategies could prevent the concentration of salt from increasing at a rate faster than that with no plants operating that would, without this action, occur if the Sea were to achieve a new water surface equilibrium. These measures would require additional feasibility studies and would also have to be coordinated with the Salton Sea Authority's restoration project activities.

A program to mitigate water consumption by the two power plants in Mexico could conceivably consist of one or more of the measures described above. Mitigation opportunities in Mexico may also be possible and could augment the benefits of these actions.

2.4.2 Air Quality

For air quality, the mitigation measures can be evaluated on a per-unit or individual project basis. The evaluation of impacts includes examples of reductions in PM_{10} and NO_x emissions that could occur as a result of updating engines in agricultural and transportation

[3] The transfer project would reduce water delivery to the IID service area by up to 300,000 ac-ft/yr (4.73 m^3/s) (IID 2002).

equipment and use of more efficient, newer automobiles. These examples could be assembled into a program that would mitigate impacts from emissions from the developers' power plants. The EIS evaluates possible elements of such a program, but does not specify combinations of elements.

The following mitigation measures identified by the ICAPCD are also considered under this alternative. None of the measures, individually or collectively, would be able to offset the total quantities of PM_{10} or gaseous emissions produced by the power plants. However, implementation of one or more of these measures would serve to improve air quality in Imperial County. Later sections describe potential offsets in the Mexicali region.

- ***Paving of Roads:*** The Imperial County Public Works Director provided the ICAPCD with a list of about 50 road segments totaling 23 mi (37 km) that could be paved to reduce fugitive dust emissions. Asphalt paving would cost about $430,000 per mile, assuming a two-lane road (Mercer 2004).

- ***Retrofitting of Emission Controls on Imperial Irrigation District (IID) Power Plants:*** The ICAPCD suggested that SCR installation on IID steam plant Unit 3 and the peaker plants would reduce NO_X emissions in the area of the projects. However, the IID already plans to repower this unit in 2007–2008 as a combined-cycle gas-fired unit to reduce NO_X emissions.

- ***Enhancing the Use of Compressed Natural Gas in Motorized Vehicles:*** Four projects were identified as follows: (1) provide $150,000 in funding to maintain the El Centro Compressed Natural Gas refueling facility located at Commercial and Fairfield Streets; (2) provide $250,000 in funding for a compressed natural gas fast-fill facility to be constructed at the Calexico Unified School District; (3) acquire land in Brawley, California, for construction of a compressed natural gas facility at a cost of about $250,000 to $500,000; and (4) replace or update engines for the current fleet of ten 40-ft-long (12-m-long) Imperial Valley transit buses and five smaller buses at a cost of about $4 million to $5 million. An overall reduction in particulates of approximately 0.1 ton/yr (0.1 t/yr) would result.

- ***Controlling Imperial County Airport Dust:*** Fugitive dust from natural windstorms and from aircraft (particularly from helicopter landings) occurs frequently at the airport. Estimated funding of $150,000 would be needed to either treat bare desert soils with dust retardants or to purchase crushed rock to cover the soil surface in the most sensitive areas. A reduction in particulates of 15 tons/yr (14 t/yr) could be achieved.

- ***Retrofitting of Diesel Engines for Off-Road Heavy-Duty Vehicles:*** Diesel engines of off-road vehicle equipment used in agriculture, earthmoving, or construction would be updated to reduce particulate and gaseous emissions. Estimated funding of $250,000 would be needed for this effort. Depending on the retrofit program implemented, overall particulate engine emissions could be reduced by about 3.3 tons/yr (3 t/yr).

Several other mitigation measures could be implemented in the Mexicali region that could serve to improve regional air quality. These include a program to replace older automobiles and buses in the Mexicali area with a newer, less polluting, fleet; reduction of fugitive dust through road paving; and reduction of emissions from brick kilns by converting the fuel used in firing the kilns to natural gas.

2.5 COMPARISON OF ALTERNATIVES

A comparison of the impacts resulting from each of the four alternatives is provided in Table 2.5-1. The impacts are summarized by resource area (e.g., water resources) and its corresponding section number in this report.